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13. ABSTRACT *(Maximum 200*

A cohort was assembled of 3885 women from the Surveillance, Epidemiology, and End Results (SEER) Registry, who were aged 65 or older at the time of diagnosis of early stage breast cancer in 1991, who underwent initial surgical treatment, and for whom Medicare claims could be linked. During the two years following the initial treatment period, 62% underwent annual mammography, and 85% had at least one mammogram. When controlling for other factors, including age, stage, and geographic site, women were less likely to receive annual mammography if initially treated with breast-conserving surgery (BCS) without radiation (OR 0.36, 95% CI=0.28, 0.45) or mastectomy, (OR 0.43, 95% CI=0.36, 0.52) compared to women initially treated with BCS with radiation. Women with initial stage I (OR 0.75, 95% CI=0.59, 0.95) or II (OR 0.61, 95% CI=0.47, 0.78) disease were less likely to receive annual mammography than women with in-situ disease. Among this cohort of older breast cancer survivors, those at highest risk for disease recurrence were least likely to undergo annual mammography.

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4.) TABLE OF CONTENTS

5.) INTRODUCTION

Randomized trials conducted in Europe (1, 2) indicate little benefit from surveillance testing of survivors of early stage breast cancer survivors who are clinically free of disease. The generally accepted strategy for follow-up includes surveillance mammography, and periodic office visits. Some previous data indicate that many breast cancer survivors receive substantial testing to detect distant disease recurrence, but no population-based data are available.

This study utilizes selected population-based secondary data bases to explore issues relevant to the surveillance of early stage breast cancer patients aged 65 and older, after initial treatment. The specific aims of this study are:

1. To describe the use of medical resources (e.g. office visits, bone scans, chest radiographs, blood tests) in patients who have undergone mastectomy or breast-conserving surgery with radiation for early stage breast cancer.

2. To relate the use of these resources to patient characteristics (e.g. age, race, census tract indicators of socioeconomic status), and hospital characteristics (e.g. size of metropolitan area, teaching hospital status).

3. To determine whether an association exists between patterns of intensity in use of surveillance resources and two outcomes: death from breast cancer, and inpatient hospital days associated with a diagnosis of metastatic cancer.

6.) BODY

a.) General Considerations

In last year's report, we submitted information on the surveillance practice patterns for a cohort of a fraction SEER-Medicare linked patients who were initially treated for breast cancer in 1985-87 and for whom Medicare Part B claims were available. The reviewer criticized the generalizability of the study population, a criticism with which we agreed. We also felt that descriptive data regarding practice patterns dating to the mid 1980's were of less interest than more recent data. Therefore, during this grant year we have been able to secure updated SEER-Medicare linked data. These data include breast cancer patients diagnosed through 1993, with their Medicare claims through 1994. In addition to being more current, these data have the major advantage that 100% of the patients have Medicare Part B data from 1991-1994. (This is in contrast to older Medicare data, which Part B claims were only available for a 5% sample of most states). Therefore the population studied will be more representative of the overall SEER population.

In addition to securing an updated cohort of breast cancer patients for study, we have secured data from a 5% sample of Medicare beneficiaries residing within the SEER counties, and who have been determined by NCI not to be included in the SEER registry. This cohort will function as a population-based set of non-cancer control patients for the SEER Medicare linked (cancer) patients. We plan to compare these controls to our breast cancer cohort patients to better assess the volume of tests and office visits which are attributable to the fact that the patients are breast cancer survivors.

The time and effort required to secure and process the updated linked data cases and population control data have been significant. During the past grant year, we have had to

read in and process about 200 9-track tapes. Various problems have been encountered and dealt with, such as a box of tapes that was crushed in transit. However, we feel it is worth the effort to be able to enhance our study by using the new data.

b.) Mammography Use Among Older Breast Cancer Survivors

The purposes of this study were to describe rates of use of mammography among a population-based cohort of older women who had been treated for early stage breast cancer in 1991, and to explore determinants of such use.

Methods

Sources of Data

A linked claims and clinical data base was used in the study (3). The clinical data base consisted of the Surveillance Epidemiology and End Results (SEER) Registry. The SEER cancer registry collects cancer incidence, staging, and initial treatment data from 9 geographic sites in the United States including 5 States and 4 Metropolitan regions: Iowa, Connecticut, Utah, Hawaii, New Mexico, Atlanta, Detroit, Seattle, and San Francisco. The Medicare files utilized were Medicare Part A or inpatient billing, and Medicare Part B, or outpatient physician bills. Since neither SEER nor Medicare collect information regarding socioeconomic characteristics, the patient's socioeconomic status was estimated by linking cases to the 1990 US Census database at the census tract (when available), or zip code level (4). Data regarding the size of the metropolitan area of the county of residence of each subject was obtained from the Area Resource File (5). The study was approved by the institutional review board of the Medical College of Wisconsin.

Cohort Development

A cohort was developed utilizing elements from the SEER data base. Inclusion criteria were the following; women age 65 years or older, first breast cancer diagnosis in 1991, diagnosis confirmed histologically, unilateral disease, AJCC stage of in situ, stage I, or stage II, and having undergone mastectomy or breast conserving surgical treatment. There were 5401 women that met these criteria. Cases were excluded from the cohort if they were not enrolled in part A and part B of Medicare for 36 months after diagnosis or if they were enrolled in an HMO for any time during the study period (991 persons), or if they died within 36 months of the diagnosis (525 persons). These criteria provided a cohort of 3885 for analysis.

Treatment

Treatment was categorized into three groups: 1) mastectomy, 2) breast conserving surgery (BCS) with radiation, or 3) BCS without radiation. Cases were coded as receiving mastectomy if they were coded in SEER as having undergone any mastectomy treatment, with or without axillary lymph node dissection. Cases were coded as receiving breast conserving surgery if they had undergone less than total mastectomy (segmental mastectomy, lumpectomy, quadrantectomy, tylectomy, wedge resection, excisional biopsy, or partial mastectomy) with or without axillary node dissection.

Surveillance periods were based on the time from initial surgical treatment. SEER records include the month and year of cancer diagnosis, but no treatment dates. Therefore, inpatient hospital records were searched to identify a treatment date. For those cases in which a MEDPAR procedure matched the SEER treatment (82% of cohort), the date was

determined to be the date of the surgical procedure in MEDPAR. If no treatment date was clearly established, the date was assumed to be the 15'th of the month of diagnosis.

Comorbidity and Socioeconomic Status

In any data base study, the potential influence of comorbidity must be considered (6). The study cohort excluded those with the highest comorbidity by excluding those that within 36 months of diagnosis. However, we wished to better assess any potential bias of comorbidity on the study findings. The inpatient Medicare claims include more extensive comorbidity information than the outpatient claims. Women undergoing BCS were less likely to have a treatment hospitalization identified than women undergoing mastectomy. Therefore, to avoid bias in the estimation of comorbidity by treatment group (mastectomy vs. BCS), we searched the files of each patient to identify the number of hospitalizations in the year prior to diagnosis and used this as a measure of comorbidity. An estimate of each patient's socioeconomic status was made by linking the patient's census tract (if available) or zip code to the 1990 national census. For 82% of the cohort, a census tract linkage could be made; a zip code linkage was used for the remaining 18%. Census-based information included per capita income and the percent of the adults over 25 years of age completing 4 or more years of college. From the patient's county of residence, the federal Area Resource File was used to determine the population density of the area in which the patient resided, categorized as metropolitan areas $\geq$ 250,000 persons or metropolitan/rural areas of < 250,000 persons.

Mammography Use

For each patient, the first 6 months after initial treatment were considered part of the treatment period. Months 6-18 after initial treatment were considered surveillance year 1 and months 18-30 were considered surveillance year 2. Mammogram claims in each surveillance period were determined, using HCPCS procedure codes 76090, 76091, and 76092 (7). Surveillance activity was categorized into three groups. No Mammography was defined as having no mammogram in surveillance year 1 or year 2. One year Mammography was defined having one or more mammograms in either year 1 or year 2 but not in both years. Annual Mammography was defined as having one or more mammograms in both year 1 and year 2.

Statistical Analysis

Univariate analyses evaluated associations between patient factors (age at diagnosis, race, comorbidity), clinical factors (stage of disease, treatment), socioeconomic factors (per capita income, education, size of metropolitan statistical area), and SEER participant site, with the use of annual mammography. For purposes of analysis variables were categorized as follows: age (less than 75 years, 75 to 84 years, 85 years and older), race (white, black, or other/unknown), percent of adults 25 years and older in the community with a college education (less than 13%, 13% to 19.9%, 20% to 33.9%, 34% and over), mean per capita income (less than $12,000, $12,000 to $14,999, $15,000 to $19,999, $20,000 and over), and metropolitan size (250,000 or less, greater than 250,000). A multivariate logistic regression analysis was utilized to control simultaneously among possible predictors. Factors considered in modeling annual mammography included age at diagnosis, race, AJCC clinical stage, treatment, and the community indicators of metropolitan area size, average per capita income, percent of adults 25 years and older in the community with a college education, and SEER participant site. A second logistic regression model was developed to identify factors predictive of subjects who had received one or more mammograms in the two year surveillance period studied (i.e., subjects in the annual mammography or one year only mammography groups). Stepwise logistic regression was

used for modeling endpoints. To assess the possible bias of comorbidity, a separate analysis was repeated for a "healthy" cohort, defined as those patients who had no hospitalizations in the year prior to their breast cancer diagnosis.

Results

Description of Cohort

Of the 3885 women diagnosed with early stage breast cancer in 1991, the majority were less than 75 years of age with a mean age of 73.5 years (SD 6.5 years).

The cohort was composed primarily of white women (Table 1). Almost 90% had invasive breast cancer with the remainder In Situ at diagnosis. Almost 80% of the cohort had no hospitalizations in the year prior to diagnosis, with most of the remaining subjects having one hospitalization identified during that time period. The most common treatment undergone was mastectomy, followed by BCS with radiation, and then BCS without radiation. The majority of the cohort lived in more urban communities with the greatest single contributor of patients being the Detroit SEER site. The median per capita income was $15,000 and the median percent of adults over the age of 25 years with a college education in the communities in which subjects lived was 20%.

Mammography Use

Of the total cohort, 62% underwent annual mammography defined as a mammogram in surveillance year 1 and in surveillance year 2 (Table 2). An additional 23% had a mammogram in surveillance year 1 or surveillance year 2 but not in both years. Finally, 15% had no mammogram in either surveillance year. In univariate analyses, older women were less likely to undergo annual mammography, especially those older than 84. Women with stage II disease were less likely to have annual mammography than women with stage In Situ or stage I disease. Use of annual mammography also varied with treatment received. Women who underwent breast conserving surgery without radiation were less likely to receive annual mammography than other women. There was no significant difference in the rates of annual mammography by race. Women living in communities with higher per capita incomes (greater than $12,000), were more likely to undergo annual mammography than women living in communities with lower per capita incomes. There was no significant association of metropolitan size or percent of college educated adults in the community, and mammography use.

Multivariate Analysis

A multivariate logistic regression model was developed to predict the use annual mammography while controlling for demographic, clinical, and socioeconomic factors (Table 3). After controlling for other predictors, women initially treated with BCS without radiation therapy were the least like to have undergone annual mammography. Both women treated with BCS without radiation and those treated with mastectomy were significantly less likely to undergo annual mammography than those undergoing BCS with radiation. Women with stage I or stage II disease at diagnosis were less likely to undergo annual mammography than women with in-situ disease. Age remained a significant predictor of undergoing annual mammography. Even when controlling for other factors, increasing age was associated with less use of annual mammography. Race was not a significant predictor of the use of annual mammography in the multivariate model. There was no significant association between per capita income and the use of annual mammography in the multivariate analysis. The association of education with use of annual mammography did not demonstrate a clear trend: women living in communities in the third

quartile of education were more likely to use annual mammography than other women. With respect to geographic sites; women diagnosed in San Francisco, Connecticut, New Mexico, Seattle, and Utah were less likely to use annual mammography than women diagnosed in Detroit. In order to assess the potential effect of comorbidity on the results of the multivariate model, the analysis was repeated in a subset of the cohort consisting of those subjects with no hospitalizations in the year prior to diagnosis. The size and direction of the effect for predictors of annual mammography use remained constant in this stratified analysis.

The standard of annual mammography is relatively strict, therefore we also evaluated predictors of receiving mammography in at least one of the two surveillance years studied. This criteria was considered a minimal surveillance strategy. Treatment, stage at diagnosis, and age remained significant predictors of the receipt of minimal surveillance mammography in this model (Table 3). The direction and size of effects of treatment, stage, and age were similar to that of the baseline model predicting annual mammography. Race was also a significant predictor in the model predicting minimal surveillance, with black women found to be less likely than white women to receive at least one mammogram in the 2 year period studied. There were no significant associations between per capita income, education, or metropolitan area size and the receipt of minimal mammography surveillance. Women were less likely to receive at least one mammogram in the period if they were diagnosed in San Francisco, New Mexico, Seattle, or Utah compared to women diagnosed in Detroit.

Discussion

Our most striking finding is the association of initial treatment with use of mammography in the 2 year follow-up period. Specifically of concern is the fact that women treated with BCT without radiation were the least likely to undergo follow-up mammography, but they are likely the most at risk for local disease recurrence. The findings persist when controlling for age. Comorbidity, at lest as well as it can be measured from these secondary data, does not appear to explain this finding. Also, all women in this cohort were considered healthy enough to undergo initial surgery for their breast cancer, and all patients selected for this study lived for at least 36 months after diagnosis of the breast cancer. It is also of interest that women with more advanced stage disease at diagnosis also were less likely to be adherent with mammography recommendations. It is possible that some women underwent mammography but did not generate a Medicare claim, for example, by paying for the test themselves. However, we know of no reason to suspect differential submission of claims across strata of age, stage, and treatment groups.

Table 1. Description of Cohort

Variable	n	% of Cohort
Age		
65-74 years	2344	60
75-84 years	1284	33
≥ 85 years	257	7
Race		
White	3525	91
Black	145	4
Other/Unknown	215	5
AJCC Stage		
In Situ	421	11
Stage I	2169	56
Stage II	1295	33
Comorbidity*		
0		79
1		18
≥2		4
Treatment		
Mastectomy	2434	63
BCS w/Radiation	860	22
BCS w/out Radiation	591	15
Metropolitan Size		
≤ 250,000	2844	73
> 250,000	1038	27
SEER Site		
Detroit	772	20
Connecticut	726	19
Iowa	683	18
Seattle	597	15
San Francisco	398	10
Atlanta	249	6
Utah	205	5
New Mexico	171	4
Hawaii	84	2
Community Variables Per Capita Income		
25'th Percentile	$12,000	
Median	$15,000	
75'th Percentile	$20,000	
Community % w/ Higher Education		
25'th Percentile	13%	
Median	20%	
75'th Percentile	34%	

*Comorbidity categorized as the number of hospitalizations the subject had in the year prior to the diagnosis of breast cancer.

Table 2. Association of Demographic, Clinical, and Socioeconomic Variables with Receipt of Annual Mammography or No Mammography in Study Cohort*

Characteristic	n	Annual Mammography n (%)	No Mammography n (%)	p-value
Total Cohort	3885	2390 (62)	587 (15)	
Age				
65-74 years	2344	1597 (68)	248 (11)	0.001
75-84 years	1284	713 (56)	231 (18)	
≥ 85 years	257	80 (31)	108 (42)	
Race				
White	3525	2184 (62)	519 (15)	0.18
Black	145	79 (55)	31 (21)	
Other/Unknown**	215	127 (59)	37 (17)	
Stage				
In Situ	421	288 (68)	50 (12)	0.001
AJCC Stage I	2169	1371 (63)	290 (13)	
AJCC Stage II	1295	731 (56)	247 (19)	
Treatment				
Mastectomy	2434	1408 (58)	423 (17)	0.001
BCS w/Radiation	860	673 (78)	37 (4)	
BCS w/out Radiation	591	309 (52)	127 (22)	
Metropolitan Size				
>250,000	2844			0.08
<250,000	1038			
Per Capita Income (quartiles) **(Need exact #'s from T. McAuliffe)** 1'st (to ~ 12,000)	987	550 (56)	167 (17)	0.002
2'nd (to ~$15,000)	965	607 (63)	136 (14)	
3'rd (to ~$20,000)	967	621 (64)	133 (14)	
4'th (>$20,000)	966	612 (63)	151 (16)	
Community % w/ Higher Education (quartiles)				
1'st (to 13%)	986	594 (60)	154 (16)	0.07
2'nd (to 20%)	967	587 (61)	136 (14)	
3'rd (to 34 %)	965	631 (65)	133 (14)	
4'th (> 34%%)	967	578 (60)	164 (17)	

* Subjects were categorized as undergoing annual mammography (in surveillance year 1 and 2), one year only mammography (in surviellance year 1 or surveillance year 2 but not both years), or no mammography in the 2 year time period studied. This table reports the number of subjects in the annual mammography and no mammography groups.

**This category consists of 2.2% (n=85) of subjects of unknown race and 3.4% of subjects with other race (n=130).

Table 3. Multivariate Logistic Models Predicting Annual Mammography Surveillance and Minimal Mammography Surveillance.

Predictor	Odds Ratio Annual Surveillance (95%CI)	p-value	Odds Ratio Minimal Surveillance (95% CI)	p-value
Age				
(ref: < 75 yrs)				
75-84 yrs	0.64 (0.54, 0.72)	<0.001	0.58 (0.47, 0.71)	<0.001
≥ 85 yrs	0.26 (0.19, 0.35)	<0.001	0.20 (0.15, 0.27)	<0.001
Stage				
(ref: In situ)				
AJCC I	0.75 (0.59, 0.95)	0.02	0.83 (0.59, 1.16)	0.27
AJCC II	0.61 (0.48, 0.78)	0.001	0.60 (0.42, 0.85)	<0.01
Treatment				
(ref: BCS with RT)				
BCS w/out RT	0.36 (0.28, 0.45)	<0.001	0.22 (0.15,0.33)	<0.001
Mastectomy	0.43 (0.36, 0.52)	<0.001	0.26 (0.18, 0.37)	<0.001
Race				
(ref: white)				
Black	-		0.57 (0.37, 0.89)	0.01
Other/Unknown	-		0.86 (0.57, 1.32)	0.50
Education(quartiles)				
ref: Best Educated				
Up to 13% college ed.	1.02(0.84, 1.25)	0.83	-	
Up to 20% college ed.	1.03(0.87, 1.23)	0.70	-	
Up to 34% college ed.	1.28 (1.07, 1.53)	<0.01	-	
SEER Site				
ref: Detroit				
Hawaii	0.72 (0.44, 1.17)	0.19	0.53 (0.27, 1.04)	0.07
Iowa	0.86 (0.69, 1.08)	0.19	0.90 (0.65, 1.24)	0.52
Atlanta	0.74 (0.54, 1.01)	0.06	0.86 (0.55, 1.34)	0.50
San Francisco	0.64 (0.49, 0.83)	0.001	0.58 (0.40, 0.82)	<0.01
Connecticut	0.78 (0.62, 0.98)	0.03	0.78 (0.57, 1.08)	0.13
New Mexico	0.41 (0.29, 0.58)	<0.001	0.48 (0.31, 0.75)	0.001
Seattle	0.74 (0.58, 0.94)	0.01	0.61 (0.44, 0.85)	<0.01
Utah	0.32 (0.23, 0.45)	<0.001	0.40 (0.26, 0.60)	<0.001

* Minimal surveillance is defined as having at least one mammography in the 2 year surveillance period evaluated.
† OR absent for variables that not in the multivariate model predicting annual surveillance
‡ OR absent for variables not in the multivariate model predicting minimal surveillance

c.) Use of Surveillance Tests and Office Visits Among Older Breast Cancer Survivors.

The above data on mammogram use raise the question of how the use of mammography among breast cancer survivors compares to the use among other female Medicare beneficiaries. This same question is also relevant to the use of other procedures which breast cancer survivors are known to undergo for surveillance purposes, such as bone scans, chest radiographs, and office visits. We believe that the difference in use of these procedures among breast cancer patients and controls will provide an estimate of the use attributable to the diagnosis of breast cancer.

Since we now have available the population-based control data, we can directly address these questions. As we have only recently received data, we have only some preliminary data to report.

Methods

We assembled a cohort similar to the cohort described above. We selected female breast cancer patients for whom linked Medicare files were available, and who met the following criteria: diagnosis of a first breast cancer in 1991, age at diagnosis > 64 years, resident of one of the nine original SEER sites, and diagnosis confirmed histologically. This provided 6596 patients. Patients were dropped if stage > AJCC Stage II, bilateral disease at diagnosis, or no surgical treatment was undergone. At this point, 5401 patients remained. Patients were then excluded if they did not remain alive, eligible for Medicare Parts A & B, and not in an HMO for at least 30 months after diagnosis. These criteria provided 3980 cases for analysis. Up to 5 non-cancer female controls per case (n=18,240) were matched for age and geographic site. The controls were also required to be alive, eligible for Medicare Parts A and B, and not in an HMO for the 30 months after the case patient's diagnosis. Part B records were searched to determine the use of tests and office visits for case and control patients.

Results

The mean age of the subjects was 73.6 years (sd = 6.6). The race of the cases was 90.6% white, 3.9% black, and 5.5% other or unknown. The controls were 88.7% white, 6.3% black, and 6.0% other or unknown ($p < 0.001$). The stage of disease of case patients was 11% in situ, 56% stage I, and 34% stage II. During the 2 year period after the case patient's initial treatment, 86% of cases vs 40% of controls had one or more mammograms ($p < 0.001$). During the same period, 80% of cases vs 55% of controls had one or more CXR's ($p < 0.001$). The use of bone scans was lower, with 26% of cases and 3.5% of controls having one or more bone scans during the 2-year period ($p < 0.001$).

The annual number of office visits was greater among cases (median 7.5 per year) than controls (median 4.5 per year) ($p < 0.001$). Only 1% of cases and 2.4% of controls had no claims for an office visit during the 2-year period. However, 43% of cases vs 22% of controls had an average of more than 8 office visits per year ($p < 0.001$).

Discussion

These results are preliminary, and require further analysis. However, of interest is the finding that almost as many case patients underwent CXR's as underwent mammography, despite the lesser level of evidence supporting screening chest radiographs. This may not be so surprising, though, given the high rate of CXR's in the controls and the fact that the

controls were more likely to undergo a CXR than a mammogram. The relative use of bone scans was much greater in cases than controls, although the absolute use was lower. The high number of office visits among cases raises questions about coordination of care for these breast cancer survivors.

We are proceeding with further analyses to determine whether the same patients tend to undergo several of these tests, the provider types for the office visits, and whether the intensity of surveillance testing varies by initial treatment for the breast cancer (especially for patients undergoing BCT without radiotherapy), as we have found for use of mammography.

7.) CONCLUSION

Follow-up mammography was not uniformly used in a cohort of older breast cancer survivors. Those at the highest risk for local recurrence (women initially undergoing BCT without radiation and women with higher stage disease) were least likely to undergo annual mammography.

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9.) APPENDICES

1. Dept of Defense Abstract
   M.Schapira, TL McAuliffe, AB Nattinger. "Underuse of Surveillance Mammography after Breast Cancer Treatment in a Medicare Population"

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EXTENDED ABSTRACT (SINGLE SPACE)

UNDERUSE OF SURVEILLANCE MAMMOGRAPHY AFTER BREAST CANCER TREATMENT IN A MEDICARE POPULATION

Marilyn M. Schapira, Timothy L. McAuliffe, Ann B. Nattinger

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EXTENDED ABSTRACT: BEGIN SINGLE SPACE 2-PAGE ABSTRACT BELOW THIS LINE

Annual surveillance with mammography is recommended in breast cancer survivors both to detect local recurrence of disease and to detect a second primary. However, the actual use of this test in older women who have undergone breast cancer treatment is unknown. The use of surveillance mammography among women who have undergone breast-conserving surgery (BCS) without radiotherapy is of particular interest, as rates of local breast recurrence in women receiving such treatment are reported as high as 25-40%.

The objective of this study was to describe mammography use after initial surgical treatment in a cohort of older breast cancer survivors. The primary data sources were the Surveillance, Epidemiology, and End Results (SEER) tumor registry data, and Medicare part A and part B claims data bases. To estimate socioeconomic status and urban vs. rural residence, elements of the U.S. Census and the Area Resource File were used. A study cohort of women who were diagnosed with in-situ, local, or regional stage breast cancer in 1986-87, and treated surgically, was developed and followed prospectively for a 30 month period after initial treatment to identify mammography use. Subjects were excluded from the cohort if they were not eligible for Medicare Part A and Part B benefits during the full study period or they belonged to an HMO during any part of the study period. Subjects were also excluded if they died within 30 months of initial treatment. The mammography use for each subject was categorized in three groups: 1) Annual Surveillance-the subject received one or more mammograms in year 1 and year 2 after treatment, 2) Biennial Surveillance-the subject received one or more mammograms in year 1 or year 2 but not in both years, or 3) No Surveillance-the subject did not have a mammogram claim in year 1 or year 2.

LIST UP TO 5 KEYWORDS. TYPE "KEYWORDS:" FOLLOWED BY UP TO FIVE

Keywords: Breast Cancer, Mammography, Surveillance, Health Services Research, Medicare.

BEGIN CONTRACT ACKNOWLEDGMENT HERE (IF ANY)

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The cohort consisted of 4040 women. The mean age of the cohort was 73.7 years (SD 6.7). Ninety-five percent of the cohort was Caucasian and 4% was African-American. Sixty-two percent had local stage disease at diagnosis, 30% had regional stage disease, and 8% had carcinoma-in-situ at diagnosis. Seventy-five percent of the cohort underwent a mastectomy, 12.5% underwent BCS with radiation, and 12.5% underwent BCS without radiation. Overall, 38.9% of the subjects underwent annual mammography during the two year surveillance period, 25.5% underwent biennial mammography, and 35.6% did not undergo mammography. The use of mammography decreased with older age ($p<0.001$). For example, the use of annual mammography was 47.7% in women aged 65-69 but 22.5% in women aged 80 and older. The use was also lower in African-American women ($p=0.007$), with use of annual mammography 26.8% in blacks and 39.4% in whites. The use was much lower among women undergoing BCS without radiotherapy as initial treatment ($p<0.001$), with use of annual mammography 14.1% in such women, compared to 41.9% in women undergoing BCS with radiotherapy, and 42.5% in women undergoing mastectomy. Among women treated with BCS without radiotherapy, 66.2% had no evidence of surveillance mammography, compared to 35.5% of women treated with BCS with radiotherapy and 30.6% of women treated with mastectomy. Stage of disease at diagnosis was not associated with use of surveillance mammography.

A backward stepwise logistic regression model was constructed to determine independent predictors of receipt of annual surveillance mammography. This model initially included the patient-level factors of age (years, modelled as a quadratic), race (African-American vs other), stage (in-situ, local or regional), and treatment (mastectomy, BCS with radiotherapy, BCS without radiotherapy), and the community-level factors of per capita income, college-education in 10% or more of adults, size of metropolitan area.The table provides results of the logistic model. After simultaneously controlling for all factors, the use of annual mammography was 72% lower among women treated with BCS without radiotherapy. The use of annual mammography was also 38% lower among African-American women. Lower use of mammography continued to be observed with advancing age and among women living in areas of lower educational status.

Receipt of Annual Mammography (Multivariate Model)

Patient-level Factors	Odds Ratio (95% CI)
Treatment	
BCS without Radiotherapy	0.28 (0.21-0.36)
Race	
African-American	0.62 (0.42-0.91)
Age	
70 vs 65 years	0.96
75 vs 65 years	0.76
80 vs 65 years	0.50
85 vs 65 years	0.27
Community-level Factors	
Education	
≥ 10% College educated	1.37 (1.07-1.75)
Size of Community	
≥ 250,000 persons	0.81 (0.68-0.97)

We conclude that the use of surveillance mammography in a population-based cohort of Medicare beneficiaries was lower than expected. The use was particularly low in women who had undergone BCS without radiotherapy, the treatment group at highest risk of local recurrence. African-American women and women of older age or lower educational status were also less likely to have received annual mammography. Efforts to increase mammography adherence should target older breast cancer survivors, in addition to the general population.

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DEPARTMENT OF THE ARMY
US ARMY MEDICAL RESEARCH AND MATERIEL COMMAND
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REPLY TO
ATTENTION OF:

MCMR-RMI-S (70-1y) 20 Jun 00

MEMORANDUM FOR Administrator, Defense Technical Information Center, ATTN: DTIC-OCA, 8725 John J. Kingman Road, Fort Belvoir, VA 22060-6218

SUBJECT: Request Change in Distribution Statements

1. The U.S. Army Medical Research and Materiel Command has reexamined the need for the limitation assigned to technical reports written for Award Number DAMD17-94-J-4043. Request the limited distribution statement for Accession Document Numbers ADB225277, ADB235938, and ADB249595, be changed to "Approved for public release; distribution unlimited." These reports should be released to the National Technical Information Service.

2. Point of contact for this request is Ms. Virginia Miller at DSN 343-7327 or by email at Virginia.Miller@det.amedd.army.mil.

FOR THE COMMANDER:

PHYLIS M. RINEHART
Deputy Chief of Staff for
Information Management